

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions of claims in the application:

Claims:

1. (Currently Amended) A method of optimizing a number, spacing and size of fractures in a subterranean formation, the method implemented in a computer system comprising at least one processor and a memory, the method comprising the steps of:

a) selecting a method to model each fracture;

b) modeling each fracture in accordance with the selected method, so as to provide modeled dimensions and a location for each fracture;

[[a)]] c) determining one or more geomechanical stresses induced by each fracture based on the modeled dimensions and location of each fracture;

[[b)]] d) determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures;

[[c)]] e) determining a predicted stress field based on the geomechanical stresses induced by each fracture; and

[[d)]] f) generating an optimized number, spacing and size for two or more fractures in a subterranean formation, where generating the optimized number, spacing and size for one or more fractures in a subterranean formation is based, at least in part, on one or more of:

the geomechanical maximum number of fractures; and

the predicted stress field based on the geomechanical stresses induced by each fracture.

2. (Currently Amended) The method according to claim 1, wherein steps ~~(a), (b), and (c)~~ (a) through (e) are performed prior to creating any of the fractures in the subterranean formation.

3. (Previously Presented) The method according to claim 1, further comprising the steps of:

determining a cost-effective number of fractures;

determining an optimum number of fractures, where the optimum number of fractures is the maximum cost-effective number of fractures that does not exceed the geomechanical maximum number of fractures.

4. (Original) The method according to claim 1, further comprising the step of spacing the fractures a uniform distance from each other.

5. (Original) The method according to claim 1, further comprising the step of creating the fractures with a uniform size.

6. (Currently Amended) The method according to claim 1, further comprising the steps of:

creating one or more fractures in the subterranean formation; and

repeating steps ~~(a), (b), and (c)~~ (a) through (e) after each fracture is created.

7. (Original) The method according to claim 6, wherein the repeating step comprises the steps of gathering and analyzing real-time fracturing data for each fracture created.

8. (Original) The method according to claim 7, wherein a well is placed in the subterranean formation, the well comprising a wellhead, a tubing, and a well bore, the well bore comprising a downhole section, and wherein the gathering of real-time fracturing data comprises the steps of:

(i) measuring a fracturing pressure while creating a current fracture;

(ii) measuring a fracturing rate while creating the current fracture; and

(iii) measuring a fracturing time while creating the current fracture.

9. (Original) The method according to claim 8, wherein the measuring of fracturing pressure is accomplished using one or more transducers located at the wellhead.

10. (Original) The method of claim 8, wherein the measuring of fracturing pressure is accomplished using one or more transducers located down hole.

11. (Original) The method according to claim 8, wherein the fracturing pressure is measured in the tubing.

12. (Original) The method according to claim 7, wherein analyzing of real-time fracturing data comprises the steps of:

determining a new stress field, based on the real-time fracturing data; and
comparing the new stress field with the predicted stress field.

13. (Original) The method according to claim 12, further comprising the step of decreasing the number of fractures in response to the real-time fracturing data.

14. (Original) The method according to claim 12, further comprising the step of increasing the distance between the fractures in response to the real-time fracturing data.

15. (Original) The method according to claim 12, further comprising the step of adjusting the size of the fractures in response to the real-time fracturing data.

16. (Original) The method according to claim 1, wherein the subterranean formation comprises a well bore comprising a generally vertical portion.

17. (Original) The method according to claim 16, wherein the well bore further comprises one or more laterals.

18. (Currently Amended) A computer program stored in a tangible medium for optimizing a number, spacing and size of fractures in a subterranean formation, comprising executable instructions that cause at least one processor to:

a) select a method to model each fracture;

b) model each fracture in accordance with the selected method, so as to provide modeled dimensions and a location for each fracture;

[[a)]] c) determine one or more geomechanical stresses induced by each fracture based on the modeled dimensions and location of each fracture;

[[b)]] d) determine a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures;

[[c)]] e) determine a predicted stress field based on the geomechanical stresses induced by each fracture; and

[[d)]] f) generate an optimized number, spacing and size for two or more fractures in a subterranean formation, where when generating the optimized number, spacing and size for one or more fractures in a subterranean formation is based, at least in part, on one or more of:
the geomechanical maximum number of fractures; and

the predicted stress field based on the geomechanical stresses induced by each fracture.

19. (Currently Amended) The computer program according to claim 18, wherein the executable instruction for performing steps ~~(a), (b), and (c)~~ (a) through (e) are executed by the at least one processor prior to creating any of the fractures in the subterranean formation.

20. (Previously Presented) The computer program according to claim 18, further comprising the steps of:

determining a cost-effective number of fractures;

determining an optimum number of fractures, where the optimum number of fractures is the maximum cost-effective number of fractures that does not exceed the geomechanical maximum number of fractures.

21. (Currently Amended) The computer program according to claim 18, further comprising executable instructions to cause the at least one processor to:

create one or more fractures in the subterranean formation; and

repeat steps ~~(a), (b), and (c)~~ (a) through (e) after each fracture is created.

22. (Currently Amended) The computer program according to claim 21, wherein the executable instructions that cause the at least one processor to repeat steps ~~(a), (b), and (c)~~ (a) through (e) comprise executable instructions that cause the at least one processor to gather and analyze real-time fracturing data for each fracture created.

23. (Previously Presented) The computer program according to claim 22, wherein the executable instructions that cause the at least one processor to analyze real-time fracturing data further cause the at least one processor to:

determine a new stress field, based on the real-time fracturing data; and

compare the new stress field with the predicted stress field.

24. (Currently Amended) A method of fracturing a subterranean formation, comprising the step of:

optimizing a number, spacing and size of fractures in the subterranean formation, the step of optimizing comprising:

a) selecting a method to model each fracture;

b) modeling each fracture in accordance with the selected method, so as to provide modeled dimensions and a location for each fracture;

[[a)]] c) determining one or more geomechanical stresses induced by each fracture based on the modeled dimensions and location of each fracture;

[[b)]] d) determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures; and

[[c)]] e) determining a predicted stress field based on the geomechanical stresses induced by each fracture;

[[d)]] f) ~~inducting~~ inducing at least one fracture in the subterranean formation; and

[[e)]] g) generating an optimized number, spacing and size for two or more fractures in a subterranean formation, where generating the optimized number, spacing and size for one or more fractures in a subterranean formation is based, at least in part, on one or more of:

the geomechanical maximum number of fractures; and

the predicted stress field based on the geomechanical stresses induced by each fracture.

25. (Currently Amended) The method according to claim 24, wherein substeps ~~(a), (b), and (c)~~ (a) through (e) of the optimizing step are performed prior to creating any of the fractures in the subterranean formation.

26. (Original) The method according to claim 24, wherein the optimizing step further comprises the substeps of:

determining a cost-effective number of fractures;

determining an optimum number of fractures, where the optimum number of fractures is the maximum cost-effective number of fractures that does not exceed the geomechanical maximum number of fractures.

27. (Currently Amended) The method according to claim 24, further comprising the steps of:

creating at least a second fracture in the subterranean formation; and

repeating substeps ~~(a), (b), and (c)~~ (a) through (e) of the optimizing step after each fracture is created.

28. (Original) The method according to claim 27, wherein the repeating step further comprises the steps of gathering and analyzing real-time fracturing data for each fracture created.

29. (Original) The method according to claim 28, wherein analyzing of real-time fracturing data comprises the steps of:

determining a new stress field, based on the real-time fracturing data; and
comparing the new stress field with the predicted stress field.

30. (Previously Presented) The method of claim 1, wherein generating an optimized number, spacing and size for two or more fractures in a subterranean formation comprises:

generating an optimized number, spacing and size for three or more fractures in the subterranean formation.

31. (Previously Presented) The computer program of claim 18, wherein the executable instructions that cause the at least one processor to generate an optimized number, spacing and size for two or more fractures in a subterranean formation, further cause the at least one processor to:

generate an optimized number, spacing and size for three or more fractures in the subterranean formation.